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SPECIFICATION

1. Title of the Invention: Communication protocol controller

2. Claim(s)

A communication protocol control system having structures that implement multiple layers of communication protocols, comprising:

protocol implementation blocks associated with the layers and each providing an entry point; and

a directory service block containing identifiers with which the entry points provided by the layers are identified, wherein:

said directory service block is referenced in order to retrieve an identifier, and transmission is performed by implementing protocols of layers that start with any layer identified with the identifier; and

when data is received from other communication protocol control system connected on a local area network, said directory service block is referenced in order to retrieve an identifier, reception is performed by implementing protocols of layers, which end with the same layer as the layer with which the layers of protocols implemented in the data transmission start, on the basis of the identifier, and the resultant data is then transferred to a receiving-side user.

3. Detailed Description of the Invention

Industrial field of utilization

The present invention relates to a communication protocol control system to be connected on a local area network.

Prior art

A communication protocol control system included in a local area network system comprises structures for implementing multiple layers of communication protocols on the basis of the OSI reference model stipulated in the ISO standards. Various kinds of processing are performed with implementation of the layers. Fig. 3 shows a configuration attempting to speed up processing (for example, Japanese Unexamined Patent Publication No. 61-63139).

Referring to Fig. 3, a communication protocol control unit 3 comprises a DMA control block 10, a layer 7 reception block 21, a layer 7 transmission block 22, a layer 6 reception block 31, a layer 6 transmission block 32, a layer 5 reception block 41, a layer 5 transmission block 42, a layer 4 reception block 51, a layer 5 transmission block 52, a layer 3 reception block 61, a layer 3 transmission block 62, a layer 2 reception block 71, a layer 2 transmission block 72, a reception control unit 81, a transmission control unit 82, and a transmission line interface 90. When a user issues a data transmission request, a CPU 1 transfers user data to a memory 2 over a system bus 600. In addition, the CPU 1 issues a transmission request to the layer 7 transmission block 22 by way of the system bus 600 and the DMA control block 10. The layer 7 transmission block 22 having received the transmission request implements a protocol of layer 7 to produce protocol data and a header, and issues a transmission request to the layer 6 transmission block 32 over a communication line 300. The layer 6 transmission block 32 having received the transmission request implements a protocol of layer 6 to produce protocol data and a header, and issues a transmission request to the layer 5 transmission block 42 over the communication line 300. Likewise, the layer 5 transmission block 42, layer 4 transmission block 52, layer 3 transmission block 62, and

layer 2 transmission block 72 implement protocols of respective layers to produce protocol data items of the respective layers and protocol headers, and issue a transmission request to transmission blocks associated with immediately lower layers over the communication line 300. The transmission control block 82 having received a transmission request from the layer 2 transmission block 72 retrieves user data from the memory 2 by way of a communication line 200 and the DMA control unit 10, and implements a protocol. Thereafter, when the transmission control unit 82 is given a transmission authority, the transmission control unit 82 places the user data on the transmission line 100 via the transmission line interface 90. Moreover, when data is received from other user, who is accommodated by a local area network, over the transmission line 100, the reception control block 81 notifies the CPU 1 of the reception of data by way of the communication line 201, DMA control unit 10, and system bus 600. Thereafter, after a protocol is implemented, a reception directive is given to the layer 2 reception block 71 over the communication line 301. The layer 2 reception block 71 having received the reception directive from the reception control block 81 implements a protocol of layer 2 in processing of received data. Thereafter, the layer 2 reception block 71 issues a reception directive to the layer 3 reception block 61 over the communication line 301. Likewise, the layer 4 reception block 51, layer 5 reception block 41, and layer 6 reception block 31 implement protocols of respective layers, and then issue a reception directive to reception blocks associated with immediately lower layers. The layer 7 reception block 21 having received a reception directive from the layer 6 reception block 31 over the communication line 301 implements a protocol of layer 7 in processing of transmitted data. Thereafter, the layer 7 reception block 21 notifies the CPU 1 of the completion of reception by way of the communication line 201, DMA control unit 10, and system bus 200. Thus, according to the

conventional method, communication protocol control systems interconnected over a local area network communicate with each other.

Problems to be solved by the invention

However, in the foregoing conventional system, since the uppermost layer alone provides an entry point, the protocols of all layers must be implemented. This poses a problem in that communicating emergent data or data needed to be treated in real time requires a large overhead. In addition, if any of communication protocol control systems interconnected over a local area network does not support all the layers, it is impossible to communicate with the control system.

The present invention attempts to solve the problems. An object of the present invention is to provide a communication protocol control system that can communicate emergent data or data needed to be treated in real time, and that enables communication with a communication protocol control system that does not support all the layers.

Means for solving the problems

The present invention comprises protocol implementation blocks associated with layers and each providing an entry point, and a directory service block containing identifiers with which the entry points provided by the layers are identified. When data is communicated from a user, the directory service block is referenced in order to retrieve an identifier. The data is transmitted by implementing protocols of layers that start with any layer identified with the identifier. Moreover, when data is received from other communication protocol control system connected on a local area network, the directory service block is referenced in order to retrieve an identifier. Protocols of layers ending with the same layer as the layer with which the layers of protocols implemented in data transmission are implemented in processing of the data on the basis of the identifier. Thereafter, the data is transferred to a receiving-side user. Consequently, emergent data or data needed to be treated in real time can be communicated, and a communication protocol

control system that does not support all the layers can be communicated with.

Operation

Owing to the foregoing constituent features, an entry to any layer can be made based on an identifier recorded in the directory service block. Consequently, emergent data or data needed to be treated in real time can be communicated. Moreover, communication with a communication protocol control system that does not support all layers agreed on within a local area network is enabled.

Embodiment

Fig. 1 is a block diagram of a communication protocol control unit included in a communication protocol control system in accordance with an embodiment of the present invention. The same reference numerals are assigned to components identical to those shown in Fig. 3. Referring to Fig. 1, a communication protocol control unit 3 comprises a user interface 4, a directory service block 5, a layer 7 implementation block 20, a layer 6 implementation block 30, a layer 5 implementation block 40, a layer 4 implementation block 50, a layer 3 implementation block 60, a layer 2 implementation block 70, a transmission/reception control block 80, and a transmission line interface 90.

The directory service block 5 contains, as shown in Fig. 2, names to be designated by a user, identifiers associated with the names, and entry points provided by layers identified with the identifiers. For example, when a user designates name 4 (704), an associated identifier is id5. The entry point provided by layer 5 is retrieved based on the identifier id5. The contents of the directory service block 5 are distributed to all communication protocol control systems interconnected over the local area network.

Referring to Fig. 1, when a user designates name 4 (704) for transmission, the user interface 4 having received a transmission request accesses the directory service block 5, retrieves identifier id5 on the basis of name 4 (704), and acquires the entry point provided by layer 5 identified with

id5. Based on the acquired entry point, the user interface 4 transmits a transmission request to the layer 5 implementation block 40 over a communication line 500. The layer 5 implementation block having received the transmission request from the user interface 4 implements a protocol of layer 5 to produce protocol data and a protocol header, and transmits a transmission request to the layer 4 implementation block 50 over the communication line 500. Likewise, the layer 4 implementation block 50, layer 3 implementation block 60, and layer 2 implementation block 70 implement protocols of respective layers, and transmit a transmission request to implementation blocks associated with immediately lower layers. The transmission/reception control block 80 having received the transmission request from the layer 2 implementation block 70 over the communication line 500 implements a protocol. After given a transmission authority, the transmission/reception control block 80 places user data, which is processed by implementing the protocols of respective layers, on a transmission line 100 via the transmission line interface 90. At this time, the user data is transmitted together with the identifier (id5).

When data is received from any other communication protocol control system connected on the local area network, the transmission/reception control block 80 having received data via the transmission line interface 90 over the transmission line 100 accesses the directory service block 5 over the communication line 400 on the basis of an identifier contained in the data. The transmission/reception control block 80 then checks if the entry point identified with the identifier corresponds to the entry point provided by the layer associated with the transmission/reception control block 80. In this case, since the identifier is id5, with the transmission/reception control block 80 implements a protocol and transmits a reception directive to the layer 2 implementation block 70 over the communication line 500. At this time, a user is notified of the reception of data via the user interface 4 over the communication line 500.

Likewise, the layer 2 implementation block 70, layer 3 implementation block 60, and layer 4 implementation block 50 access the directory service block 5 over the communication line 400 on the basis of the identifier id5, and check if the entry point identified with the identifier correspond to the entry points provided by the layers associated therewith. Since the entry points provided by the layers are different from the entry point identified with the identifier, the layer 2 implementation block, layer 3 implementation block, and layer 4 implementation block implement the protocols of layers assigned thereto, and then transmit a reception directive to the implementation blocks associated with immediately higher layers. The layer 5 implementation block 40 having received a reception direction from the layer 4 implementation block 50 over the communication line 500 accesses the directory service block 5 over the communication line 400 on the basis of the identifier id5. The layer 5 implementation block 40 then compares the entry point identified with the identifier id5 with the entry point provided by the layer associated therewith. In this case, since the identifier id5 indicates the entry point provided by layer 5, the entry points agree with each other. Consequently, the layer 5 processing unit 40 implements the protocol of layer 5, and then transmits received data, which is processed by implementing protocols of layers equal to and lower than layer 5, to the user via the user interface 4 over the communication line 500.

As mentioned above, according to the present embodiment, communication protocol control systems interconnected over a local area network can communicate with one another. Consequently, since an identifier (for example, id1) a user enters at a transmission/reception control block or a user designates a name (for example, name N (708), emergent data or data needed to be treated in real time can be communicated without the necessity of implementing all protocols of layers. Moreover, a communication protocol control system that does not support all the layers can be communicated with

by utilizing an identifier, with which an entry point provided by an uppermost layer supported by the system is identified, or a name.

Effect

As described so far, according to the present invention, when a user communicates data, a directory service block is referenced in order to retrieve an identifier, and an entry to any layer can be made based on the identifier. Moreover, when data is received from any other communication protocol control system connected on the local area network, the directory service block is referenced. Protocols of layers ending with the same layer as the layer to which an entry is made for transmission are implemented based on an identifier sent together with the data. Consequently, emergent data or data needed to be treated in real time can be communicated. Moreover, communication with a communication protocol control system that does not support all layers of protocols agreed on within a local area network is enabled.

4. Brief Description of the Drawings

Fig. 1 is a block diagram showing a communication protocol control unit included in a communication protocol control system in accordance with an embodiment of the present invention. Fig. 2 shows an example of a format in which data is recorded in a directory service block included in the communication protocol control unit. Fig. 3 is a block diagram showing a communication protocol control unit included in a conventional communication protocol control system.

3---communication protocol control unit, 4---user interface, 5---directory service block, 20---layer 7 implementation block, 30---layer 6 implementation block, 40---layer 5 implementation block, 50---layer 4 implementation block, 60---layer 3 implementation block, 70---layer 2 implementation block, 80---transmission/reception block, 90---transmission line interface, 10---transmission line, 400, 500---communication line

FIG. 1

4: USER INTERFACE

3: COMMUNICATION PROTOCOL CONTROL UNIT

20: LAYER 7 IMPLEMENTATION BLOCK

30: LAYER 6 IMPLEMENTATION BLOCK

40: LAYER 5 IMPLEMENTATION BLOCK

50: LAYER 4 IMPLEMENTATION BLOCK

60: LAYER 3 IMPLEMENTATION BLOCK

70: LAYER 2 IMPLEMENTATION BLOCK

80: TRANSMISSION/RECEPTION CONTROL BLOCK

90: TRANSMISSION LINE INTERFACE

100: TRANSMISSION LINE

FIG. 2

5: DIRECTORY SERVICE BLOCK

701: LAYER 7 ENTRY POINT 702: LAYER 7 ENTRY POINT

703: LAYER 6 ENTRY POINT 704: LAYER 5 ENTRY POINT

705: LAYER 2 ENTRY POINT

706: TRANSMISSION/RECEPTION BLOCK ENTRY POINT

708: TRANSMISSION/RECEPTION BLOCK ENTRY POINT

FIG. 3

2: MEMORY 10: DMA CONTROL BLOCK

21: LAYER 7 RECEPTION BLOCK

22: LAYER 7 TRANSMISSION BLOCK

31: LAYER 6 RECEPTION BLOCK

32: LAYER 6 TRANSMISSION BLOCK

41: LAYER 5 RECEPTION BLOCK

42: LAYER 5 TRANSMISSION BLOCK

51: LAYER 4 RECEPTION BLOCK

52: LAYER 4 TRANSMISSION BLOCK

61: LAYER 3 RECEPTION BLOCK

62: LAYER 3 TRANSMISSION BLOCK

71: LAYER 2 RECEPTION BLOCK

72: LAYER 2 TRANSMISSION BLOCK

81: RECEPTION CONTROL BLOCK

82: TRANSMISSION CONTROL BLOCK

90: TRANSMISSION LINE INTERFACE

3: COMMUNICATION PROTOCOL CONTROL UNIT

100: TRANSMISSION LINE